

ORIGINAL ARTICLE

Multimorbidity among elderly in Bangladesh

Hasna Hena Sara¹  | Muhammad Abdul Baker Chowdhury²  | Md. Aminul Haque¹ 

¹Department of Population Sciences, University of Dhaka, Dhaka, Bangladesh

²Department of Emergency Medicine, University of Florida, Gainesville, Florida

Correspondence

Md. Aminul Haque, Room No 4046, Arts Building, Department of Population Sciences, University of Dhaka, Dhaka 1000, Bangladesh.

Email: aminul.haque@du.ac.bd

Abstract

Background: Multimorbidity among the elderly is a major public health problem in most of the developing countries, including Bangladesh, where the population is moving towards aging. *Multimorbidity* was defined as the co-occurrence of at least two chronic diseases in a person whether as a coincidence or not. Little attention has been paid to the study of the prevalence of multimorbidity among the elderly in Bangladesh.

Objective

The objectives of this study were to estimate the prevalence of multimorbidity among hospitalized elderly.

Methods

A cross-sectional study was conducted in two tertiary level hospitals with a sample of 566 adults aged 60 years or more. Data were collected from medical examination reports at the hospital and using a semi-structured interview schedule through an in-person interview. Descriptive statistics were used to measure the prevalence of multimorbidity.

Results

The overall prevalence of multimorbidity among the elderly was 56.4% and the prevalence was higher among females (64.18%) than males (54.17%). The most prevalent conditions were hypertension (33.0%), diabetes (27.6%), ischemic heart disease (12.0%), and chronic obstructive pulmonary disease (9%).

Conclusion

A high prevalence of multimorbidity suggests that there is an urgent need to develop geriatric health-care services. Policymakers should pay attention to developing effective intervention strategies and programs to reduce the burden of multimorbidity.

KEYWORDS

Bangladesh, elderly, multimorbidity, pattern, prevalence

1 | INTRODUCTION

The world is on the edge of a demographic transition; most of the countries throughout the world are experiencing population ageing resulting in an increase in the number of older adults. The

number of people in the world aged 60 years or older is projected to increase by 56%, from 901 million to 1.4 billion between 2015 and 2030; and by 2050, the number is projected to be 2.1 billion.¹ Moreover, the number of people aged 80 years or older (the “older-old”) is growing even faster than the number of older

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2018 The Authors. *Aging Medicine* published by Beijing Hospital and John Wiley & Sons Australia, Ltd.

persons overall.¹ It is projected that by 2050 the number of older-old people will be 434 million, which is almost threefold the number in 2015 (125 million).¹

As developed countries undergo faster epidemiological transition and face a lot of problems due to chronic disease, the prevalence of multimorbidity is a greater concern for developed nations and has been studied in Europe,²⁻⁴ the Middle East,⁵ Australia,⁶ USA,⁷⁻⁹ Canada,¹⁰⁻¹² and Sweden.⁴ It is estimated that about one in four adults experience multimorbidity, with half of older adults having three or more chronic conditions in the USA.^{6,11} In Bangladesh, life expectancy at birth has increased from 47 years in 1960 to 71 years in 2015.¹³ It is expected to be 75 years by 2020 and 78 years by 2040.¹³ With increasing life expectancy, the number of the elderly population has also increased and population aging creates many challenges for the country.

Multimorbidity is associated with increased mortality, poor quality of life, and an increased demand on health-care resources.^{14,15} It remains a significant ongoing problem, with the number of affected patients continuing to rise,^{16,17} affecting individuals of all ages and both sexes.^{18,19} Data on multimorbidity are required to determine the health-care needs associated with different multimorbidity patterns, to bring health systems up to date in order to reduce multimorbid deaths, to map out good strategies for the allocation of resources, and to ensure the right and necessary medical equipment to enhance quality health care. In particular, the identification of multimorbidity patterns in a country would enhance understanding of how some chronic diseases occur together and also provide knowledge about the health-care needs associated with different multimorbidity patterns. However, the majority of the studies have focused on specific illnesses. Dementia, for instance, has been investigated extensively enough to allow the estimation of worldwide occurrence.²⁰

Several other studies have concentrated on a relatively small number of diseases, such as cardiovascular diseases,⁸ diabetes,^{8,21,22} hypertension,^{8,21} arthritis,^{6,22,23} cancer,²² chronic obstructive pulmonary disease (COPD),^{8,24} and osteoporosis,^{21,22} rather than the whole range of chronic morbidities. Such information could inform decisions in the health systems in order to reduce multimorbid deaths. However, a limited number of such studies have been conducted in developing countries.

People's experiences of multiple chronic diseases and their prevalence are essential to establish an appropriate health-care service; however, the prevalence of multimorbidity is not sufficiently known for developing countries. Afshar et al. compared the prevalence of multimorbidity across low- and middle-income countries, and investigated patterns by age and education, as a proxy for socioeconomic status by using chronic disease data from 28 countries of the World Health Survey (2003).²⁵ Data were extracted and inter-country socioeconomic differences were examined by gross domestic product. They found the mean world standardized multimorbidity prevalence for low- and middle-income countries was 7.8% (95% confidence interval [CI], 7.79%-7.83%). In all countries, multimorbidity increased significantly with age. A positive but non-linear relationship was also found between country gross domestic product and multimorbidity prevalence.²⁵

The Bangladesh Bureau of Statistics (BBS) conducted a Health and Morbidity Status Survey in 2012, where self-reported data were collected on multimorbidity.²⁶ Khanam and colleagues conducted a study on multimorbidity in Bangladesh in 2011, where they only collected data for nine specific diseases by clinical examination²⁷; however, they failed to include diabetes, respiratory tract infection, upper gastrointestinal (GI) tract disorders, lower GI tract disorders, as well as many other chronic diseases that have been found as most prevalent among the elderly in many other studies.²⁸

Understanding patterns and identifying common clusters of chronic diseases helps policymakers, researchers, and clinicians to understand the needs of the care process better and to potentially save both provider and patient time and cost. There are few such studies on particular clusters of chronic conditions that comprise the patterns of multimorbidity. To the best of our knowledge, there are currently very few studies in Bangladesh describing specific patterns of multimorbidity among the elderly. Therefore, the aim of this study was to estimate the prevalence and patterns of multimorbidity among elderly people in Bangladesh.

2 | METHOD

2.1 | Study participants

This cross-sectional hospital-based study was conducted in two tertiary-level hospitals in Bangladesh. The target population included all hospitalized patients aged 60 years and older with a diagnosed condition reported in their medical records. We excluded from the study individuals who were: in the advanced stage of chronic disease, undergoing treatment with antiviral therapy, having neurological or communication problems, or from the criminal and/or mental ward.

2.2 | Study design and sample selection

A two-stage stratified sampling procedure was used in the study. In the first stage, two medical college hospitals were selected randomly from 29 medical college hospitals in Bangladesh. A complete list of the hospital wards was carried out from all of the selected hospitals and then a complete bed listing was carried out in the selected hospital to prepare a sampling frame for the second-stage selection of respondents. In the second stage of sampling, the respondent was selected from the list proportionately to provide statistically reliable estimates.

2.3 | Sample size

The sample size was estimated to be 381 by using the key variable, that is, prevalence of multimorbidity among the elderly population was $P = 0.54$, $q = 0.46$, and $d = 0.05$.²⁷ After using the design effect 1.5, the sample size was 572.²⁹ A total of 572 respondents were interviewed for the study; however, six respondents were unable to answer questions about psychological distress and health-related quality of life. Finally, 566 respondents were included in the analysis.

2.4 | Outcome variable

We considered multimorbidity as the outcome variable. *Multimorbidity* was defined as existence of two or more chronic conditions within an individual. This definition was chosen as it best fits the context of this research question and is one of the most commonly used definitions across the literature.

2.5 | Instruments and data collection

Data were collected during April to June 2017 by a structured questionnaire through face-to-face interview. Socioeconomic and demographic variables were collected from the medical records and clinical variables were collected from diagnosis reports and interviews with the respondents. The Cumulative Illness Rating Scale (CIRS) was used to calculate the pattern of multimorbidity.³⁰ The CIRS uses the presence of illness in each of 14 organ domains plus a measure of severity of each domain to provide an index of total chronic medical illness burden. The 14 organ domains that are included in the scale are cardiac, vascular, hematological, respiratory, ophthalmological or ear-nose-throat (ENT) system, upper or lower GI, hepatic, renal, genitourinary, musculoskeletal, neurological, endocrine, and psychiatric. This instrument was chosen because it takes the severity of the illness into consideration, it is not only based on a simple account of the number of medical conditions within a person, and also due to the easiness of the structure of the instruments.³¹

2.6 | Ethical approval and informed consent

The research evaluation committee of the Department of Population Sciences, University of Dhaka approved the study. Both Mymensingh Medical College Hospital and Rangpur Medical College Hospital also approved the study as a study site. For each participant, verbal consent was obtained before starting the interview/data collection.

2.7 | Statistical analysis

Descriptive statistics were used to measure the prevalence of multimorbidity in this analysis. The prevalence of multimorbidity was calculated in relation to age and sex. Age was grouped into three categories: 60-69 years (young-old), 70-79 years (middle-old), and 80 years or more (older-old). CSPro version 6.0 was used for data entry. SPSS version 22.0 and Stata version 14.0 were used for analyses.

3 | RESULTS

Table 1 presents the sociodemographic characteristics of hospitalized elderly respondents. A total of 566 respondents were interviewed, 434 (76.4%) of whom were male and 134 (23.6%) were female. Approximately 80.8%, 12.9%, and 6.3% of the respondents were in the young-old (60-69 years), middle-old (70-79 years), and

TABLE 1 Socioeconomic characteristics of respondents

Variable	N	%
Age (years)		
Young-old (60-69)	459	80.8
Middle-old (70-79)	73	12.9
Older-old (80 +)	36	6.3
Sex		
Female	134	23.6
Male	434	76.4
Religion		
Muslim	519	91.4
Hindu	43	7.6
Christian	1	0.2
Buddhist	3	0.5
Place of residence		
Rural	421	74.12
Urban	145	25.53
Current marital status		
Married	390	68.7
Separated	26	4.6
Widowed	147	25.9
Divorced	3	0.5
Educational status		
No education	272	47.9
Primary education	138	24.3
Secondary education	114	20.1
Higher secondary	44	7.8
Engaged with any work		
Yes	164	28.9
No	404	71.1
State of economic dependence		
Partially dependent on others	143	25.2
Fully dependent on others	240	42.3
Not depending on others	183	32.2

older-old (80+ years) groups, respectively. The majority of the respondents were Muslim (91.4%), followed by Hindu (7.6%), and other religions had much lower proportions (<1.0%). About two-thirds (74.12%) of the respondents were from rural areas and only 25.53% were from urban areas. Among the respondents, 68.7% were currently married while 25.9% were widowed. Almost half of the population (47.9%) had no education, whereas 24.3% had primary education and only 7.8% had completed higher secondary education. About 42.3% of the respondents were completely economically dependent on others, 25.2% were partially dependent, and 32.2% were not dependent on others.

Figure 1 shows the prevalence of diseases in each domain of the CIRS. Among the 14 CIRS domains, the prevalence of upper GI

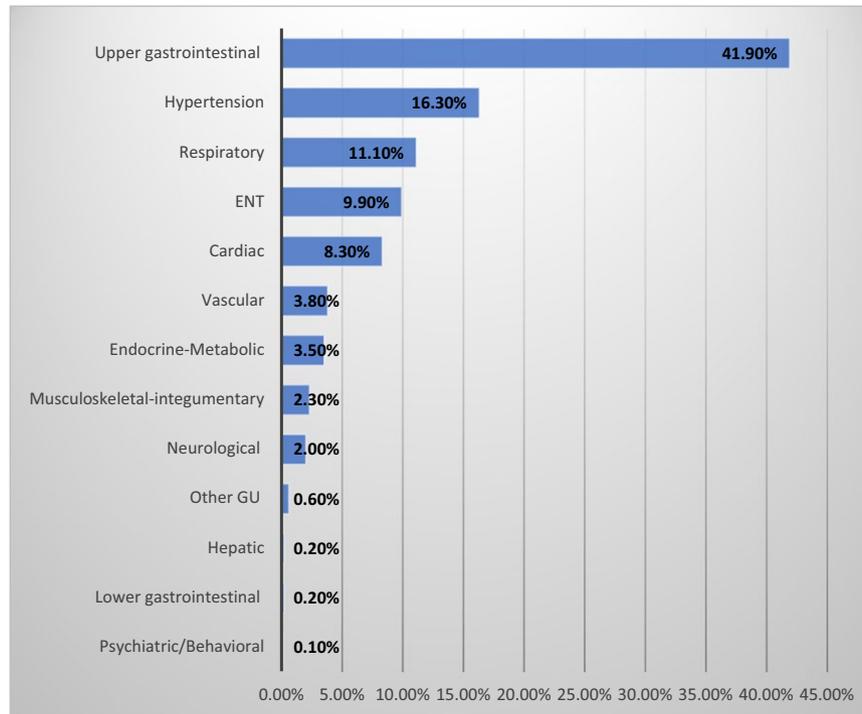


FIGURE 1 Prevalence of disease by Cumulative Illness Rating Scale. ENT, ear-nose-throat; GU, genitourinary

disease (41.90%) was the highest, followed by hypertension (16.3%), respiratory (11.1%), ENT system (9.9%), cardiac (8.3%), and vascular (3.80%) diseases. Table 2 presents the prevalence of disease according to the CIRS domains. Here, six domains are excluded due to low frequency. In the cardiac domain, ischemic heart disease ($n = 68$), congestive cardiac failure ($n = 11$), and cardiomyopathy ($n = 9$) were most prevalent, whereas COPD ($n = 51$), bronchial asthma ($n = 28$), and pulmonary tuberculosis ($n = 23$) were the most prevalent diseases in the respiratory domain. In the vascular domain, vertigo ($n = 27$) was the most prevalent. In the ENT domain, age-related cataract ($n = 44$) was the most common, followed by chronic dacryocystitis ($n = 22$), epistaxis ($n = 15$), and pterygium ($n = 9$). Diabetes mellitus (DM) was the most prevalent disease in the upper GI domain: Out of the 566 respondents, 156 had DM. After DM, acute stroke was the next most prevalent disease in the upper GI domain, followed by chronic kidney disease ($n = 35$)³² and hepatitis ($n = 31$).³¹

The prevalence rates of diseases according to their domains are presented in Figure 2, which shows that in the cardiac domain, most of the respondents had three diseases (47%) and 20% had four. Among the respondents, 55.9% had three diseases along with hypertension. Within the vascular domain, 44.2% of respondents had four diseases, followed by 16.3% with three diseases, and 27.9% with two diseases. In the ENT domain, 44.7% of respondents suffered from three diseases and 1.8% had four diseases.

The overall prevalence of multimorbidity was 56.5%, with a higher prevalence among women (64.2%) than men (54.2%; Figure 3). The most prevalent diseases among respondents by sex are presented in Table 3. Overall, hypertension (75.4% males, 24.6% females) and DM (80.1% males, 19.9% females) were the most prevalent diseases

in both sexes. Ischemic heart disease was the third most common chronic condition (60.3% males, 39.7% females) among the elderly followed by COPD (90.2% males, 9.8% females).

The numbers of diseases according to respondents' age groups are presented in Table 4. The table shows that the prevalence of disease was highest among the young-old (60–69 years) group than in the middle-old (70–79 years) and older-old (80+ years) groups. This result was similar to the study conducted by the BBS in 2015, which reported that the population aged 60–64 years had a higher proportion of health problems than other elderly groups.³³

Table 5 presents chronic health problems with a prevalence >2% and their co-occurrence rates (least prevalent diseases are excluded). It shows that respondents with hypertension have a higher tendency to be multimorbid as 95.7% of respondents suffering from hypertension were multimorbid. Similarly, 95.2% of respondents with DM were multimorbid. Respondents with stroke, ischemic heart disease, age-related cataract, chronic kidney disease, vertigo/dizziness, and liver cirrhosis also had a greater tendency to be multimorbid than others.

Table 6 presents the most common domain and disease combinations among respondents and indicates the likelihood of more complex morbidity among respondents. It shows that 41.5% of respondents suffered from cardiac and hypertension domain diseases, which is a similar proportion to those suffering from hypertension and vascular domain diseases. Almost 33.7% of respondents had diseases from another GI and hypertension domain and 16.7% of respondents had vascular and cardiac domain diseases. In cases of disease combination, 12.71% of respondents suffered from both diabetes and hypertension. On the other hand, only 0.17% of

TABLE 2 Prevalence of diseases according to domains of the Cumulative Illness Rating Scale

Name of domains							
Cardiac (n)	Vascular (n)	Respiratory (n)	Ear-nose-throat system (n)	Upper gastrointestinal (n)	Other genitourinary (n)	Musculoskeletal (n)	Endocrine (n)
Ischemic heart disease (68)	Vertigo/dizziness (27)	Chronic obstructive pulmonary disease (51)	Age-related cataract (44)	Diabetes mellitus (156)	Prostatic carcinoma (6)	Cervical disc prolapse (12)	Liver cirrhosis (26)
Congestive cardiac failure (11)	Severe anemia (12)	Bronchial asthma (28)	Chronic dacryocystitis (22)	Acute stroke (83)	Benign enlargement of prostate (1)	Swelling of face (9)	Pituitary adenoma (8)
Cardiomyopathy (9)	Non-Hodgkin lymphoma (4)	Pulmonary tuberculosis (23)	Epistaxis (15)	Chronic kidney disease (35)		Carcinoma of thyroid (2)	Metabolic acidosis (4)
Myocardial infarction (5)		Severe pneumonia (11)	Pterygium (9)	Hepatitis (31)		Carcinoma of head (1)	Diarrhea (1)
Tachycardia (2)		Bronchial carcinoma (7)	Glaucoma (6)	Breast cancer (29)		Cervical radiculopathy (1)	Edema (1)
Acute myocardial infarction (1)		Laryngitis (5)	Otitis media (5)	Abdominal pain (15)		Multiple myeloma (1)	Polycystic ovarian syndrome (1)
		Bronchitis (4)	Pharyngitis (4)	Goiter (13)			
			Tonsillitis (4)	Gastric carcinoma (10)			
			Carcinoma of tongue (1)	Carcinoma of the colon (9)			
			Sinusitis (1)	Hernia (9)			
			Sleep apnea (1)	Jaundice (9)			
			Vocal cord tumor (1)	Renal stone (8)			
			Xerophthalmia (1)	Irritable bowel syndrome (7)			

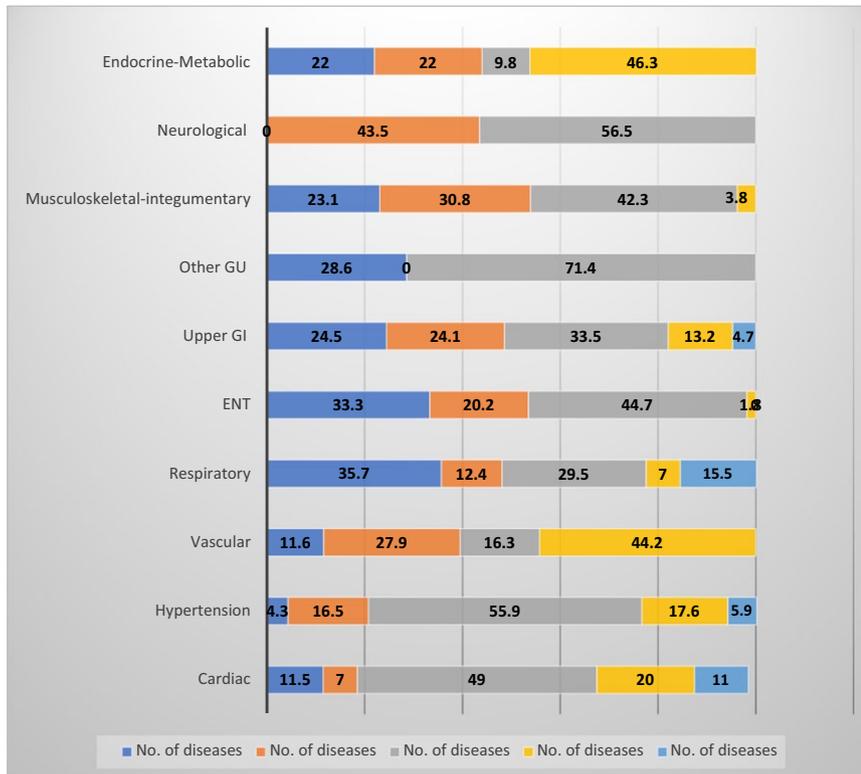


FIGURE 2 Percentage distribution of number of disease by Cumulative Illness Rating Scale. ENT, ear-nose-throat; GI, gastrointestinal; GU, genitourinary

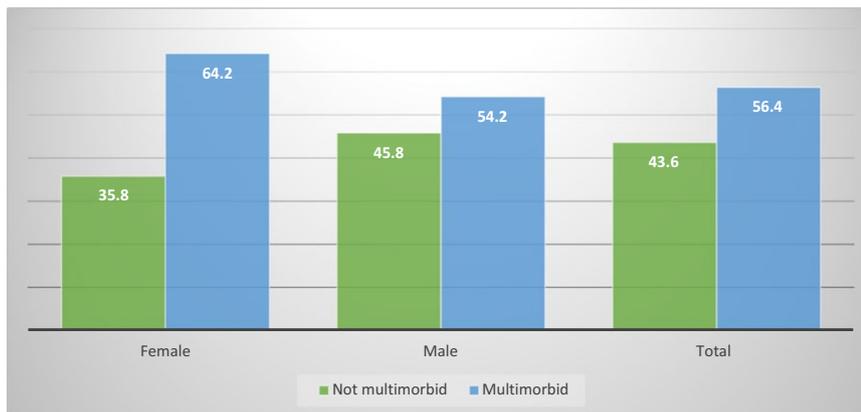


FIGURE 3 Prevalence of multimorbidity by sex

respondents suffered from asthma and COPD and 2.47% of respondents suffered from cardiovascular disease and hypertension.

4 | DISCUSSION

This hospital-based study reporting the prevalence and pattern of multimorbidity among the elderly population in Bangladesh is the first of its kind to consider all diseases. In this study, *multimorbidity* was defined as the presence of two or more chronic health problems in an elderly person, which is consistent with most of the literature.^{21,34} While previous studies in Bangladesh have collected self-reported data, this is the first study where the prevalence and pattern of multimorbidity have been measured from hospital-based medically diagnosed report data. Thus, the prevalence and pattern

of multimorbidity presented in the study are based on more authentic data than self-reported disease data.

The overall prevalence of multimorbidity was 56.4% with a higher prevalence among females than males. Similar findings were observed in previous studies in Bangladesh,²⁶ the Netherlands,³⁴ Denmark,³⁵ Kosovo,³² and Portugal.²¹ This study found that the major diseases among the hospitalized elderly population of Bangladesh were hypertension, DM, acute stroke, COPD, ischemic heart disease, and cataract. Similar results were also found in several other studies in Bangladesh and other developing countries.^{6,11,21,27,36,37} However, these findings are different from the Health and Morbidity Status Survey of Bangladesh, where self-reported data showed that fever (21%) was the most prevalent disease, followed by arthritis (15.2%), high blood pressure (10.3%), diabetes (7.2%), and peptic ulcer (6.5%).²⁶

TABLE 3 Most prevalent (top 15) diseases by sex

Disease	Female, n (%)	Male, n (%)	Total, n (%)
Hypertension	46 (24.6)	141 (75.4)	187 (33.0)
Diabetes mellitus	31 (19.9)	125 (80.1)	156 (27.6)
Acute stroke	31 (37.3)	52 (62.7)	83 (14.7)
Ischemic heart disease	27 (39.7)	41 (60.3)	68 (12.0)
Chronic obstructive pulmonary disease	5 (9.8)	46 (90.2)	51 (9.0)
Age-related cataract	14 (31.8)	30 (68.2)	44 (7.8)
Chronic kidney disease	10 (29.4)	24 (70.6)	34 (6.0)
Hepatitis	0 (0)	31 (100)	31 (5.5)
Bronchial asthma	0 (0)	28 (100)	28 (4.9)
Vertigo/dizziness	1 (3.7)	26 (96.3)	27 (4.9)
Liver cirrhosis	3 (11.5)	23 (88.5)	26 (4.6)
Pulmonary tuberculosis	0 (0)	23 (100)	23 (4.1)
Cerebrovascular disease	9 (39.1)	14 (60.9)	23 (4.1)
Chronic dacryocystitis	7 (31.8)	15 (68.2)	22 (3.9)
Breast cancer	22 (100)	0 (0)	22 (3.9)
Total	134	432	566

Multimorbidity often increases with the increase of age. Similarly, a study in the Netherlands found multimorbidity rates of 22.7%, 39.1%, and 59.2% in patients aged 55-64 years, 65-74 years, and 75+ years, respectively.³⁴ A study from Denmark also found that 25.9% of patients aged 45-64 years were multimorbid, whereas the multimorbid rate was 58.65% for those aged 65-84 years.³⁵ In contrast, this study found that young-old respondents (aged 60-69 years) were more likely to have multimorbidity than middle-old and older-old respondents, which is consistent with a survey by the BBS in which the respondents aged 60-69 years had higher rates for multimorbidity.³³ The common combination of musculoskeletal morbidity with vascular and upper GI problems may result in a non-steroidal anti-inflammatory agent increasing the severity of the other two morbidities, particularly in older patients.³⁸

TABLE 4 Percentage distribution of number of diseases according to age group

Age group (years)	One morbidity	Two morbidities	Three morbidities	Four or more morbidities
Young-old (60-69)	208 (84.60)	93 (78.20)	109 (73.60)	39 (92.90)
Middle-old (70-79)	22 (8.90)	16 (13.40)	29 (19.60)	3 (7.10)
Older-old (80+)	16 (6.50)	10 (7.40)	10 (6.80)	0 (0)

This research has described the prevalence of multimorbidity and identified some common patterns of multimorbidity in a cross-sectional sample of the hospitalized elderly in Bangladesh. Previous studies examining the prevalence of multimorbidity have largely been limited to the elderly,³⁹⁻⁴² indicating that multimorbidity is a condition of old age. However, the present study found that most of the respondents aged 60-69 years had higher rates of multimorbidity,³³ which indicates that multimorbidity is not a condition affected just by age.⁴³ Mercer et al⁴⁴ have argued that future studies "must begin to investigate multimorbidity across a life-course." Our findings provide further evidence on the importance of multimorbidity research across the life-course.

This study provides some common combinations of diseases as some conditions appear in more than one cluster, which may be vital in designing guidelines and strategies for prevention and care for people with multimorbidity. The structure and the tools of the study could be helpful for conducting a large-scale hospital-based study with a reliable diagnosis of diseases of elderly people. A large hospital-based sample with reliable diagnosis data at an individual level is required to access the multimorbidity prevalence and patterns. This study paves the way for a future study with a bigger sample that could yield a model of wider generalizability.

Future studies should focus on the multi-dimensions of the consequences of multimorbidity in Bangladesh. Disease-oriented guidelines should be adapted to clinical realities to overcome the complexities of multimorbidities.^{45,46} Future research in similar socioeconomic settings in other countries may focus on hospital-based diagnosis of diseases to identify multimorbidity rather from self-reported data. Vital sources of pathogenesis and recovery are needed to aid researchers, clinicians, and policymakers to move forward in a sensible and sustainable manner. To overcome the complexities of multimorbidity, greater focus is needed on the development of contextualized treatment protocols for the management of co-morbid conditions. Again, coexistence of multimorbidity has been found to be associated with adverse outcomes, which create burden on the health-care sector. Identifying the authentic prevalence and patterns of multimorbid patients or patients who are at risk to develop multimorbidity may help the policymakers to formulate effective prevention strategies for the country and can be implemented successfully at the field level.

4.1 | Limitations of the study

As a hospital-based study is very challenging for a country like Bangladesh, it was a major challenge to explain to the respondents

TABLE 5 Chronic health problems with a prevalence >2% and their co-occurrence rates

Disease	Multimorbidity				Total n
	No		Yes		
	n	%	n	%	
Hypertension	8	4.3	180	95.7	188
Diabetes mellitus	9	5.8	147	95.2	156
Acute stroke	5	6	78	94	83
Ischemic heart disease	6	8.8	62	91.2	68
Chronic obstructive pulmonary disease	28	54.9	23	45.1	51
Age-related cataract	18	40.9	26	59.1	44
Chronic kidney disease	12	34.3	23	65.7	35
Hepatitis	8	25.8	23	74.2	31
Cancer breast	9	31	20	69	29
Bronchial asthma	8	28.6	20	71.4	28
Vertigo/dizziness	3	11.1	24	88.9	27
Liver cirrhosis	4	15.4	22	85.6	26
Pulmonary tuberculosis	4	54.9	19	45.1	23

TABLE 6 Prevalence estimates for the most common combinations of CIRS domains and most combinations of diseases

Combination of morbidity domains	Proportion	95% CI	
		Upper	Lower
Hypertension and cardiac	41.5	0.37	0.45
Vascular and hypertension	41.5	0.37	0.45
ENT and hypertension	45.3	0.41	0.49
Upper GI and hypertension	33.0	0.29	0.37
Other GI and hypertension	33.7	0.29	0.37
Neurology and hypertension	34.0	0.3	0.38
Endocrine metabolic and hypertension	37.0	0.33	0.41
Vascular and cardiac	16.7	0.13	0.20
Vascular and endocrine	37.0	0.33	0.41
Combination of diseases			
Diabetes and hypertension	12.71	10.21	15.73
Asthma and COPD	0.17	0.02	1.25
Stroke and hypertension	8.80	6.7	11.47
CVD and hypertension	2.47	1.46	4.13

CI, confidence interval; COPD, chronic obstructive pulmonary disease; GI, gastrointestinal; CVD, cardiovascular disease.

and their family members about the reason behind this study and the underlying benefit to them. Many respondents were curious to know whether they would receive any financial benefit from the government. In addition, the study was limited to two district hospitals in Bangladesh. This research can be extended to other districts in future to provide a probable solution to the problems faced by the elderly that can be useful for the decision-makers for policy implications.

ACKNOWLEDGMENTS

We are grateful to the patients, nurses, and doctors and to the directors of Rangpur and Mymensingh Medical College Hospitals for their full-hearted support in data collection.

CONFLICT OF INTEREST

The authors confirm that they have no conflicts of interest.

ORCID

Muhammad Abdul Baker Chowdhury  <https://orcid.org/0000-0002-2145-0938>

Md. Aminul Haque  <https://orcid.org/0000-0002-9919-5404>

Hasna Hena Sara  <http://orcid.org/0000-0002-2739-5423>

REFERENCES

1. United Nations Department of Economic and Social Affairs Population Division. World Population Ageing. New York: United Nations website; 2015. http://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2015_Report.pdf. Accessed November 26, 2018.
2. Uijen AA, Lisdonk EH. Multimorbidity in primary care: prevalence and trend over the last 20 years. *Eur J Gen Pract.* 2008;14(suppl 1):28-32.
3. Schram MT, Frijters D, van de Lisdonk EH, et al. Setting and registry characteristics affect the prevalence and nature of multimorbidity in the elderly. *J Clin Epidemiol.* 2008;61:1104-1112.
4. Marengoni A, Winblad B, Karp A, Fratiglioni L. Prevalence of chronic diseases and multimorbidity among the elderly population in Sweden. *Am J Public Health.* 2008;98:1198-1200.
5. Fuchs J, Scheidt-Nave C, Hinrichs T, et al. Indicators for healthy ageing: a debate. *Int J Environ Res Public Health.* 2013;10:6630-6644.
6. Britt H, Harrison C, Miller G, Knox S. Prevalence and patterns of multimorbidity in Australia. *Med J Aust.* 2008;189:72-77.
7. Wolff JL, Starfield B, Anderson G. Prevalence, expenditures, and complications of multiple chronic conditions in the elderly. *Arch Intern Med.* 2002;162:2269-2276.
8. Fillenbaum GG, Pieper CF, Cohen HJ, Cornoni-Huntley JC, Guralnik JM. Comorbidity of five chronic health conditions in elderly community residents: determinants and impact on mortality. *J Gerontol A Biol Sci Med Sci.* 2000;55:M84-M89.
9. Hoffman C, Rice D, Sung HY. Persons with chronic conditions. Their prevalence and costs. *JAMA.* 1996;276:1473-1479.
10. Fortin M, Soubhi H, Hudon C, Bayliss EA, van den Akker M. Multimorbidity's many challenges. *Br Med J.* 2007;334:1016-1017.
11. Fortin M, Bravo G, Hudon C, Vanasse A, Lapointe L. Prevalence of multimorbidity among adults seen in family practice. *Ann Fam Med.* 2005;3:223-228.

12. Fortin M, Hudon C, Haggerty J, Akker M, Almirall J. Prevalence estimates of multimorbidity: a comparative study of two sources. *BMC Health Serv Res*. 2010;10:111.
13. Bangladesh Bureau of Statistics. *Bangladesh Population and Housing Census 2011*. Dhaka, Bangladesh: Government of the People's Republic of Bangladesh; 2015.
14. Glynn LG, Valderas JM, Healy P, Burke E, Newell J, Gillespie P. The prevalence of multimorbidity in primary care and its effect on health care utilization and cost. *Fam Pract*. 2011;28:516-523.
15. Aarts S, den Akker M, Bosma H, et al. The effect of multimorbidity on health related functioning: temporary or persistent? Results from a longitudinal cohort study. *J Psychosom Res*. 2012;73:211-217.
16. Holden L, Scuffham PA, Hilton MF, Muspratt A, Ng SK, Whiteford HA. Patterns of multimorbidity in working Australians. *Popul Health Metr*. 2011;9:15.
17. Booth HP, Prevost AT, Gulliford MC. Impact of body mass index on prevalence of multimorbidity in primary care: cohort study. *Fam Pract*. 2014;31:38-43.
18. Prados-Torres A, Poblador-Plou B, Calderon-Larranaga A, et al. Multimorbidity patterns in primary care: interactions among chronic diseases using factor analysis. *PLoS ONE*. 2012;7:e32190.
19. Prados-Torres A, Calderon-Larranaga A, Hanco-Saavedra J, Poblador-Plou B, van den Akker M. Multimorbidity patterns: a systematic review. *J Clin Epidemiol*. 2014;67:254-266.
20. Ferri CP, Prince M, Brayne C, et al. Global prevalence of dementia: a Delphi Consensus Study. *Lancet*. 2005;366:2112-2117.
21. Prazeres F, Santiago L. Prevalence of multimorbidity in the adult population attending primary care in Portugal: a cross-sectional study. *BMJ Open*. 2015;5:e009287.
22. Islam MM, Valderas JM, Yen L, Dawda P, Jowsey T, McRae IS. Multimorbidity and comorbidity of chronic diseases among the senior Australians: prevalence and patterns. *PLoS ONE*. 2014;9:e83783.
23. Agborsangaya CB, Lau D, Lahtinen M, Cooke T, Johnson JA. Multimorbidity prevalence and patterns across socioeconomic determinants: a cross-sectional survey. *BMC Public Health*. 2012;12:201.
24. Menotti A, Mulder I, Nissinen A, Giampaoli S, Feskens EJ, Kromhout D. Prevalence of morbidity and multimorbidity in elderly male populations and their impact on 10-year all-cause mortality: the FINE Study (Finland, Italy, Netherlands, Elderly). *J Clin Epidemiol*. 2001;54:680-686.
25. Afshar S, Roderick PJ, Kowal P, Dimitrov BD, Hill AG. Multimorbidity and the inequalities of global ageing: a cross-sectional study of 28 countries using the World Health Surveys. *BMC Public Health*. 2015;15:776.
26. Bangladesh Bureau of Statistics. *Health and Morbidity Status Survey*. Dhaka, Bangladesh: Bangladesh Bureau of Statistics, Statistics and Informatics Division; 2013.
27. Khanam MA, Streatfield PK, Kabir ZN, et al. Prevalence and patterns of multimorbidity among elderly people in rural Bangladesh: a cross-sectional study. *J Health Popul Nutr*. 2011;29:406-414.
28. Bagewadi S, Adhikari S, Dhrangadhariya A, et al. NeuroTransDB: highly curated and structured transcriptomic metadata for neurodegenerative diseases. *Database (Oxford)*. 2015;2015:bav099.
29. Henry G. Practical sampling. In: Henry GT, ed. *Applied Social Research Methods Series*, vol. 21. Newbury Park, CA: Sage; 1990.
30. Salvi F, Miller MD, Grilli A, et al. A manual of guidelines to score the modified Cumulative Illness Rating Scale and its validation in acute hospitalized elderly patients. *J Am Geriatr Soc*. 2008;56:1926-1931.
31. Hudon C, Fortin M, Soubhi H. Abbreviated guidelines for scoring the Cumulative Illness Rating Scale (CIRS) in family practice. *J Clin Epidemiol*. 2007;60:212.
32. Jerliu N, Toçi E, Burazeri G, Ramadani N, Brand H. Prevalence and socioeconomic correlates of chronic morbidity among elderly people in Kosovo: a population-based survey. *BMC Geriatrics*. 2013;13:22.
33. Bangladesh Bureau of Statistics. *Elderly Population in Bangladesh: Current Features and Future Perspectives*. Dhaka, Bangladesh: Bangladesh Bureau of Statistics, Statistics and Informatics Division; 2015.
34. van Oostrom SH, Picavet HS, van Gelder BM, et al. Multimorbidity and comorbidity in the Dutch population - Data from general practices. *BMC Public Health*. 2012;12:715.
35. Schiøtz ML, Stockmarr A, Host D, Glumer C, Frølich A. Social disparities in the prevalence of multimorbidity - A register-based population study. *BMC Public Health*. 2017;17:422.
36. Harrison C, Henderson J, Miller G, Britt H. The prevalence of complex multimorbidity in Australia. *Aust N Z J Public Health*. 2016;40:239-244.
37. Kirchberger I, Meisinger C, Heier M, Zimmermann AK, Thorand B, Autenrieth CS. Patterns of multimorbidity in the aged population. Results from the KORA-Age Study. *PLoS ONE*. 2012;7:e30556.
38. Fortin M, Bravo G, Hudon C, et al. Relationship between multimorbidity and health-related quality of life of patients in primary care. *Qual Life Res*. 2006;15:83-91.
39. Marengoni A, von Strauss E, Rizzuto D, Winblad B, Fratiglioni L. The impact of chronic multimorbidity and disability on functional decline and survival in elderly persons. A community-based, longitudinal study. *J Intern Med*. 2009;265:288-295.
40. Marengoni A, Rizzuto D, Wang HX, Winblad B, Fratiglioni L. Patterns of chronic multimorbidity in the elderly population. *J Am Geriatr Soc*. 2009;57:225-230.
41. Schafer I, von Leitner EC, Schon G, et al. Multimorbidity patterns in the elderly: a new approach of disease clustering identifies complex interrelations between chronic conditions. *PLoS ONE*. 2010;5:e15941.
42. Akner G. Analysis of multimorbidity in individual elderly nursing home residents. Development of a multimorbidity matrix. *Arch Gerontol Geriatr*. 2009;49:413-419.
43. Taylor AH, Miller R, Gray RD. New Caledonian crows reason about hidden causal agents. *Proc Natl Acad Sci USA*. 2012;109:16389-16391.
44. Mercer SW, Smith SM, Wyke S, O'Dowd T, Watt GC. Multimorbidity in primary care: developing the research agenda. *Fam Pract*. 2009;26:79-80.
45. Tonelli MR. Compellingness: assessing the practical relevance of clinical research results. *J Eval Clin Pract*. 2012;18:962-967.
46. Guthrie B, Payne K, Alderson P, McMurdo ME, Mercer SW. Adapting clinical guidelines to take account of multimorbidity. *BMJ*. 2012;345:e6341.

How to cite this article: Sara HH, Chowdhury MAB, Haque MA. Multimorbidity among elderly in Bangladesh. *Aging Med*. 2018;1:267-275. <https://doi.org/10.1002/agm2.12047>